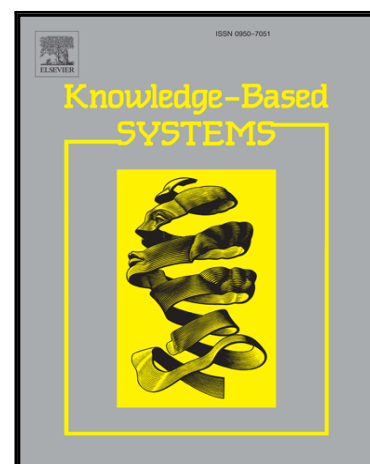


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Deriving human activity from geo-located data by ontological and statistical reasoning

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Abstract

Every day, billions of geo-referenced data (e.g., mobile phone data records, geo-tagged social media, gps records, etc) are generated by user activities. Such data provides inspiring insights about human activities and behaviors, the discovery of which is important in a variety of domains such as social and economic development, urban planning, and health prevention. The major challenge in those areas is that interpreting such a big stream of data requires a deep understanding of context where each activity occurs. In this study, we use a geographical information data, OpenStreetMap (OSM) to enrich such context with possible knowledge. We build a combined logical and statistical reasoning model for inferring human activities in qualitative terms in a given context. An extensive validation of the model is performed using separate data-sources in two different cities. The experimental study shows that the model is proven to be effective with a certain accuracy for predicting the context of human activity in mobile phone data records.

Keywords: ontology; spatial data; human activity recognition; knowledge management;

1. Introduction

In recent years, massive amounts of data are being generated, stored, and disseminated as a result of human activity. For instance, whenever a mobile phone call, monetary transaction, or social media post is made by human, geo-located data is automatically generated by mobile network provider [1, 2, 3], bank [4, 5], or social network provider (e.g., Facebook or Twitter) [6, 7, 8, 9]. A large fraction of mobile phone data reveals how people move and behave that has been shown to be extremely useful for humanitarian and development applications (Robert Kirkpatrick UN 2013¹), such as public safety and emergency management [10, 11], health and disease management [12, 13], social and economic development [14, 15], transport/infrastructure

[☆]The most experiments of this research have been conducted during the PhD study of Zolzaya Dashdorj at the University of Trento and her visiting research at the Massachusetts Institute of Technology.

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